ENGINEERING SPECIFICATION

FIBERGRATE® FRP FENCE SYSTEM

SECTION 32 31 32

FIBERGLASS REINFORCED PLASTIC FENCE SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section to include the supply and installation of a fiberglass reinforced plastic (FRP) Fence System as shown on the Contract Drawings.

1.2 REFERENCES

A. The latest revision of the publications listed below form a part of this specification to the extent referenced herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) Test Methods:

ASTM D-149 Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

ASTM D-638 Tensile Properties of Plastics

ASTM D-696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics

ASTM D-790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D-2344 Short Beam Strength of Polymer Matrix Composite Materials and Their Laminates

ASTM D-2583 Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

ASTM F-711 – Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools (Ref for Test Apparatus Only)

1.3 SUBMITTALS

A. Submit shop drawings of the FRP Fence System clearly showing material sizes, types, styles, part or catalog numbers, and details. Shop drawings should include installation instructions for the system.

B. Submit the manufacturer's published literature, certificates of compliance, and other information to support compliance with project requirements.

C. If requested, submit sample pieces of each item specified herein for acceptance by the owner.

1.4 QUALITY ASSURANCE

A. All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years experience in the design and manufacture of fiberglass reinforced plastic systems.

B. Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship.

C. To insure system integrity and compatibility, all fencing materials, including fence panels, posts, and gates shall come from a single source.

D. Manufacturer shall be certified to the ISO 9001-2008 standard.

E. Manufacturer shall provide proof of certification from at least two other quality assurance programs for its facilities or products (DNV, ABS, USCG, and AARR).

F. Manufacturer shall provide proof, via independent testing, that materials proposed as a solution, do not contain heavy metals in amounts greater than that allowed by current EPA requirements.

1.5 PRODUCT DELIVERY AND STORAGE

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer.

B. Storage of Products: All materials shall be carefully handled to prevent damage. Materials shall be stored in such a manner to provide adequate drainage, ventilation and other weather related damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. FRP Fence System shall be Fibergrate® as manufactured by

Fibergrate Composite Structures Inc.
5151 Belt Line Road, Suite 1212
Dallas, Texas 75254-7028 USA
(800) 527-4043 (972) 250-1530 Fax

Website: www.fibergrate.com
E-mail: info@fibergrate.com

2.2 MOLDED FRP FENCE PANELS

A. Fence panels shall be of a one piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Panels shall have a square mesh pattern providing bidirectional strength. Panels shall be reinforced with continuous roving of equal number of layers in each direction. The top layer of reinforcement shall be no more than 1/8" below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces.

B. Percentage of glass shall not exceed 35% by weight to achieve maximum impact resistance.

C. After molding, no dry glass fibers shall be visible on any surface. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.

D. Grating bar intersections are to be filleted to a minimum radius of 1/16" to eliminate local stress concentrations and the possibility of resin cracking at these locations.

E. Resin system: The resin system used in the manufacture of the fence panels shall be Corvex®. Color to be dark gray.

F. Fence panels to be 1" deep, 1-1/2" x 1-1/2" square mesh or 1" deep, 2" x 2" mesh with the load bars oriented parallel to the edges of the panels.

G. All cut edges shall be sanded smooth and sealed according to the manufacturer's recommendations.

H. Fence panels to be installed using 3/8" dia. ASTM A307 zinc plated carriage bolts with 1/4" thick FRP square washers.

2.3 PULTRUDED FRP LINE AND CORNER POSTS

A. Line and corner posts are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

C. Post resin shall be DYNAFORM® ISOFR, fire retardant isophthalic polyester with a tested flame spread rating of 25 or less per ASTM E 84 Tunnel Test. Line post color to be dark gray.

D. All finished surfaces of FRP items and fabrications shall be smooth, resin rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. Line posts shall be 4" x 4" x 1/4" or 6" x 6" x 1/4" wide flange sections as specified on the project drawings.

F. Corner Posts shall be 6" x 6" x 3/8" angles or as specified on the project drawings.

G. Posts are to have the minimum longitudinal mechanical and physical properties as listed below:

Property	**ASTM Method**	**Value**	**Units**
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5×10^6 (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8×10^6 (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8×10^6 (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5×10^5 (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	4.4×10^{-6} (8.0×10^{-6})	in/in/°F (cm/cm/°C)
Dielectric Strength (Lengthwise)	D-149	35	kV/inch
Dielectric Strength (Perpendicular to Face)	D-149	200	volts/mil
Flame Spread	E-84	25 or less	N/A

2.3 ELECTRICAL PERFORMANCE OF FRP MATERIALS

A. 2 inch wide x 72 inch long strips of the line post and molded fence panels are to be tested using a the 'hot stick' test rack as described in ASTM D-711 with the electrodes set at 12 inches on center.

B. In the dry condition, each sample must be capable of resisting a 95 kV potential with a current leakage of 2 milliamps or less.

C. Testing as described above must be conducted on samples of materials of the same configuration and composition as those to be used in the fence. Testing is to be conducted at a N. A. I. L. (National Association of Independent Laboratories) lab accredited for testing high voltage personnel protective equipment.

2.4 PERSONNEL GATES

A. Personnel gates are to be factory fabricated and assembled using the FRP fence panels listed above, 3" x 3" x 1/4" FRP angles, and 1/4" thick FRP plate gussets. Maximum personnel gate width is 4'-0".

B. Personnel gate is to be mounted to the line post with three each 4" x 4" stainless steel surface mount hinges.

C. Personnel gate is to be equipped with a stainless steel, lockable gate latch.

2.5 VEHICULAR GATES

A. Vehicular gates are to be factory fabricated and assembled using FRP fence panels and FRP structural shapes to conform to the design requirements of the project. Maximum two leaf gate width is 20'-0" supplied in two leaves of 10'-0" each.

B. Both the active and inactive leaf is to be equipped with a 5/8" padlockable vertical cane bolt for fixing the gate in the closed position.

C. The gate leaves are to be equipped with adjustable hinges to allow for adjustment of the gap between the leaves to eliminate the effects of soil settlement.

D. Accommodation for locking the gate leaves together is to be provided as specified by the owner.

PART 3 - EXECUTION

3.1 INSPECTION

A. The owner's representative shall field verify all site dimensions and conditions and verify that they match the shop drawings of the FRP fence.

B. Shop inspection is authorized as required by the Owner and shall be at Owner's expense. If a shop inspection is required, the fabricator shall give ample notice to Contractor prior to the beginning of any fabrication work so that an inspection may be conducted.

3.2 INSTALLATION

A. The Contractor shall install the FRP Fence system in accordance with manufacturer's installation drawings that have been released for construction.

B. Erect the FRP Line Posts with the embedment as indicated on the installation drawings. Posts are to be installed plumb and at the spacing indicated on the drawings. For Posts embedded in concrete, insure that concrete has come to sufficient cure before installing the fence panels.

C. Erect the FRP Fence Panels following the installation drawings, field cutting the full sized panels are required to fit the installation. Connect the FRP Fence Panels to the FRP Line Posts using the connection hardware provided and following the details in the installation drawings.

D. Erect the Personnel and Vehicular Gates as detailed on the installation drawings. Adjust hinges, latches, and cane bolts as required to achieve a free swinging, securely latching installation.